Copy Elision Solutions

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Copy Elision

- Explain briefly what is meant by copy elision
  - Copy elision occurs when the compiler omits a call to the copy constructor
  - Usually this is done when initializing a new object from a temporary object
  - Instead of creating a temporary object, initializing the new object from the temporary and destroying the temporary, the compiler creates the new object directly with the same arguments that would have been given to the temporary object

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Function returning temporary object

- Write a simple class. Implement the copy constructor to display a message when called
- Which other special member functions do you need to implement, and why?
  - A default constructor is required. Since the class defines a copy constructor, the compiler will not synthesize a default constructor for it
- Write a function which returns a temporary object of the class by value
- Write a program which calls this function and uses its result to initialize an object of the class

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Function returning temporary object

- How many times will the copy constructor be called?
- Run the program. Explain your observations
  - Without optimization, the copy constructor would be called twice, once for the return by value and once for the object initialization
  - Modern compilers will probably elide both calls, so the copy constructor is not called at all

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Return Value Optimization

- Explain what is meant by "Return Value Optimization" and "Named Return Value Optimization"
  - In return value optimization, a temporary variable is returned by value and the compiler elides the copy constructor call
  - In named return value optimization, a local variable is returned by value and the compiler elides the copy constructor call
- Write a simple program which demonstrates Named Return Value Optimization

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Other cases of copy elision

- Give some other examples of when copy elision can occur
  - When a function argument is passed by value
  - When an exception is caught by value (when an exception is thrown, it is copied into a memory location managed by the compiler and stored there until a suitable handler is found. If the handler catches the exception by value, this would cause another copy to be made. This second copy can be elided, but not the first.)
- Write simple programs to demonstrate these examples

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